CLAIMS

1. An optical deflection matrix comprising at least two optical deflection modules (Ma, Mb) each capable of providing:

- from an incoming light beam (f1) having a given direction of propagation (d1) an outgoing light beam (f2) having a direction of propagation taken in a first set of potential directions (d2, d3, d4), or

- from an incoming light beam (37) having a direction of propagation taken in a second set of potential directions an outgoing light beam (38) having a given direction of propagation,

characterised in that each optical deflection module comprises a single deflection element (1) of the incoming light beam capable of assuming several potential positions which are in relation to the potential directions of the first set or of the second set and two fixed return elements (2a, 2b) positioned on either side of the deflection element (1), a main potential position of the deflection element leading to a principal direction (d2) of the first set or of the second set, this principal direction being colinear with the given direction of propagation (d1) of the incoming light beam or of the outgoing light beam, the principal directions of the optical deflection modules being located in the same plane.

2. The optical deflection matrix as claimed in claim 1, characterised in that the given direction

is a fixed direction or is taken from among several potential directions.

3. The deflection matrix as claimed in any one of claims 1 to 3, characterised in that the first or the second set of potential directions comprises discrete predetermined directions.

4. The optical deflection matrix as claimed in any one of claims 1 to 3, characterised in that the deflection element (1) of a module is a mirror.

5. The optical deflection matrix as claimed in any one of claims 1 to 4, characterised in that at least one potential position of the deflection element (1) of a module is a mechanically predetermined discrete position.

6. The deflection matrix as claimed in claim 5, characterised in that an abutment (20, 20a) defines at least one mechanically predetermined position of the deflection element (1) of a module by stopping it.

7. The deflection matrix as claimed in claim 6, characterised in that the abutment (20a) is a double abutment comprising a tab (20.1a) capable of assuming two distinct positions, the tab being deflected in one of these positions.

8. The deflection matrix as claimed in either of claims 6 or 7, characterised in that a tab (5.1) is integral with the deflection element (1), this tab (5.1) being capable of assuming two distinct positions in support on the abutment (20), the tab being deflected in one of these positions.

9. The deflection matrix as claimed in any one of claims 1 to 8, characterised in that the main potential position of the deflection element (1) is a position in which it is at rest.

10. The deflection matrix as claimed in any one of claims 1 to 9, characterised in that the deflection element (1) of a module is capable of moving in rotation about an axis (y) perpendicular to at least one of the potential directions.

11. The deflection matrix as claimed in any one of claims 1 to 10, characterised in that the deflection element of a module is capable of moving in rotation about an axis (z) contained in the plane formed by the given direction (d1) and the main potential direction (d2).

12. The deflection matrix as claimed in any one of claims 1 to 9, characterised in that the deflection element (1) of a module comprises at least two reflective faces (1.1, 1.2) positioned in different planes and is capable of moving in translation so as to

generate a rotation of the planes according to an axis (R) formed by the intersection of said planes.

13. The optical deflection matrix as claimed in any one of claims 1 to 12, characterised in that the deflection element (1) of a module comprises a link arm (6) which connects it to a fixed part (100).

14. The optical deflection matrix as claimed in any one of claims 1 to 13, characterised in that the deflection element (1) of a module is on a mobile base (31).

15. The optical deflection matrix as claimed in claim 14, characterised in that the mobile base (31) is integral with a link arm (6.2) which connects it to a fixed part (100).

16. The optical deflection matrix as claimed in any one of claims 1 to 15, characterised in that it comprises means for actuating the deflection element of a module of electrostatic type comprising at least one pair of electrodes (e1, ce1), optionally in interdigitated combs.

17. The optical deflection matrix as claimed in any one of claims 1 to 16, characterised in that it comprises conduits (101) for guiding the incoming and outgoing light beams.

18. The optical deflection matrix as claimed in any one of claims 1 to 17, characterised in that it is at least partially made by techniques used in microelectronics.

19. The optical deflection matrix as claimed in any one of claims 1 to 17, characterised in that it is at least partially made by moulding techniques.

20. The optical deflection matrix as claimed in any one of claims 1 to 19, characterised in that it is at least partially made by transfer techniques.

21. The optical deflection matrix as claimed in any one of claims 1 to 20, characterised in that the two return elements (2a, 2b) of a module are symmetrical relative to a plane perpendicular to the main direction of potential propagation (d2).

22. The optical deflection matrix as claimed in any one of claims 1 to 21, characterised in that the modules (Ma, Mb) are placed in the same plane.

23. The optical deflection matrix as claimed in any one of claims 1 to 22, characterised in that each deflection element (1) of a module has a deflection plane, the deflection planes of the deflection elements in their main position being parallel or coincident.

24. The optical deflection matrix as claimed in any one of claims 1 to 23, characterised in that the optical deflection modules (M11, M21) are positioned in at least one line and/or at least one column.

25. The optical deflection matrix as claimed in claim 24, characterised in that two successive optical deflection modules (M1, M2) in a line are separated by an optical conjugation element (8).

26. The optical deflection matrix as claimed in claim 25, characterised in that when it comprises in the same line, optical conjugation elements (34) and when the optical deflection modules (Ma, M'a) comprise two return elements (2a, 2b), the optical conjugation elements (34) have colinear optical axes.

27. The optical deflection matrix as claimed in any one of claims 1 to 26, characterised in that, when it comprises several optical deflection modules in column (M11) and when the light beams have each a fixed direction of propagation, the directions of propagation are parallel.

28. The optical deflection matrix as claimed in any one of claims 1 to 27, characterised in that, when it comprises several columns, the optical

conjugation elements (8) separating two optical deflection modules belonging to successive columns are combined in a small bar.

29. The optical deflection matrix as claimed in any one of claims 1 to 28, characterised in that the return elements of the deflection modules are grouped on a same substrate (100).

30. The optical deflection matrix as claimed in claim 29, characterised in that the substrate (100) includes at least one compartment (103) for an optical conjugation element (8).

31. The optical deflection matrix as claimed in any one of claims 29 to 30, characterised in that the deflection elements (1) of the modules are grouped on the substrate (100).

32. The optical deflection matrix as claimed in any one of claims 29 to 31, characterised in that in a module, the deflection element (1) is placed opposite to the return elements (2a, 2b).

33. The optical deflection matrix as claimed in claim 29, characterised in that at least one part (2a, 2b) of the deflection modules is grouped on a common substrate(100), this substrate (100) comprising means (105) for supporting the remainder of the modules and at least one compartment (103) for one or more optical conjugation elements.

34. A routing device intended for coupling each of a plurality of optical input channels (32) with any one of a plurality of optical output channels (36) conveying light beams, characterised in that it comprises an optical input deflection matrix (MAE) as claimed in any one of claims 1 to 33, connected to the optical input channels, an optical output deflection matrix (MAS) as claimed in any one of claims 1 to 33, connected to the optical output channels and a link module (34) between the two input and output matrices.

35. The routing device as claimed in claim 34, characterised in that it comprises upstream from the optical input deflection matrix (MAE) a shaping module (33) of the light beams conveyed by the input channels.

36. The routing device as claimed in any one of claims 34 or 35, characterised in that it comprises downstream from the optical output deflection matrix (MAS) a module (35) for shaping the light beams to be conveyed by the output channels.

37. The routing device as claimed in any one of claims 34 to 36, characterised in that the optical input channels (32) and the optical output channels (36) are parallel to one another.

38. The routing device as claimed in any one of claims 34 to 37, characterised in that at least

one return device (11) is placed between the optical input deflection matrix (MAE) and the link module (34) and/or between the link module (34) and the optical output deflection matrix (MAS).